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the records. Even in small doses it has a depressing effect at once upon adding and usually upon association; and in large doses, upon all the processes. The contrast in the effect of alcohol is greatest between simple reaction and reading, on the one hand, and reactions with discriminations and adding on the other. The other mental operations occupy an intermediate position, for some subjects showing acceleration, for others a depression. The two sharply contrasted classes contain the one, sensory and intellectual; the other, motor processes. The clue to the understanding of the results is the distinction between sensory and motor modes of reaction. Sensory and intellectual processes are depressed, but motor stimulated. The different results in learning number series are to be explained by the fact that it is a motor process for some and a sensory one for others. The dynamometer record is of the latter type, so only the rate and not the strength of movement is accelerated. The effect of tea is nearly the reverse. It stimulates the sensory and intellectual processes and depresses the motor slightly. The influence of ten grams of tea shows itself for about an hour. The effect of the other drugs differs greatly from that of these two in degree and duration, but otherwise the effect of morphine (.01 grams) is like that of tea; and the effect of small doses of ether, amylnitrite, chloroform and paraldehyde is like that of alcohol. An increase of sensory or intellectual activity is always accompanied by a motor depression. The author suggests this may be due either to a selective chemical effect of the drugs upon the parts of the nervous system connected with the sensory and motor functions, or it may be due to the removal of physiological inhibitions by the depression of the higher centres. The author's interpretation of his results is beautifully illustrated by the chart at the end of the volume. Since the curves do not stand for any special experiment, the choice of ordinates is of course somewhat arbitrary.

BERGSTROM.

*Studies from the Yale Psychological Laboratory.* Edited by E. W. SCRIPTURE, PH. D. Instructor in experimental psychology. Oct., 1893.

These studies are the results of the first year's work in the Yale laboratory established and directed by Dr. Scripture. The work includes the following studies:

1. *Investigations in reaction-time and attention*, by C. B. Bliss, Ph. D.
2. *On monocular accommodation-time*, by C. E. Seashore.
3. *On the relation of reaction-time to variations in intensity and pitch of the stimulus*, by M. D. Slaterry, M. D.
4. *Experiments on the musical sensitiveness of school children*, by J. A. Gilbert.
5. *A new reaction-key and the time of voluntary movement*, by E. W. Scripture and John M. More.
6. *Drawing a straight line; a study in experimental didactics*, by E. W. Scripture and C. S. Lyman.
7. *Some new psychological apparatus*, by E. W. Scripture.

The conclusions reached in the first part of the first study were:

1. No difference in reaction-time was found when the color of the light present in the field of vision was changed.
2. No difference was found in the times of reactions in the dark and those made while looking at a stationary incandescent light of six candle-power.
3. With the light in motion, the reaction-time was lengthened.
4. No difference was detected between the times of reactions in silence and those made while listening to the steady sound of a tuning-fork making 250 vibrations per second.
5. When the intermittent sound of a metronome was substituted for the fork, the time for reactions was lengthened.
6. The reaction to a sound heard in both ears is

shorter than when the sound is heard only in one ear, even after making allowance for the difference in intensity.

The second part took up introspective observation on reactions. The results obtained here were: 1. Reaction-time is constantly affected by irregular disturbance, a large part of which may be detected by introspection. 2. Introspection is not to be trusted in estimating results. 3. Exercise shortens reaction-time. 4. Reactions to the wrong signal, reactions before the signal is heard, and the reflex nature of reactions, are not sufficient criteria to distinguish muscular from sensorial reactions. 5. There are, at least, six distinct kinds of voluntary attention: ideational attention, neural attention, feeling attention, muscular attention, preparatory attention and inattention. 6. The involuntary attention is constantly changing.

In this second part, besides noting some misquotations wholly inexcusable, the reader comes to the general feeling that the results of introspection and experimentation are unscientifically blended. One, wonders, too at such a statement as the following: "A sixth state of the attention, one which requires as much effort of a certain kind as any, is that of inattention." By this is meant a voluntary turning away of the attention from *one thing to another*. Or, as in this case, voluntary muscular relaxation.

Mr. Seashore found that: 1. Within certain limits the accommodation-time varies with the distance between the points for which the eye is to be accommodated. 2. It takes longer to change the accommodation from near to far than from far to near, and this difference in time varies directly with the length of the accommodation-time. 3. For equal distances in the same range the accommodation-time is greatest for points near the eye and decreases with the distance of the points from the eye.

Experiments with electrical stimulus applied to the skin show that the reaction-time decreases with the increase of the stimulus.

Dr. Slaterry came to the following conclusions for reactions to tones: 1. The law that the reaction-time decreases with increasing stimulus does not hold for hearing, and the reaction-times for tones of moderate intensity are about the same. 2. The longer time registered by some for very weak tones is probably caused by hesitations as to the actual hearing of the stimulus. 3. The reaction-time to tones decreases as the pitch rises. 4. The view held by Exner, Von Kries and Auerbach and rejected by Martins, namely, that about ten vibrations are necessary to the perception of a tone, no matter what its pitch, is sufficient to explain the differences in the reaction-times for different tones.

The most suggestive and interesting of these studies is the one by Mr. Gilbert, to determine the sensitiveness of children to changes in the pitch of the tone  $\bar{a} = 435$  of international pitch. For this purpose a clever instrument was devised from a pitch-pipe whose reed was fitted with a sliding clamp. Five boys and five girls were tested for each age from six to sixteen and five girls for each of eighteen and nineteen. From these tests Mr. Gilbert came to the conclusion that "the least sensitiveness occurs with children of six years, where the average least perceptible difference is  $\frac{3}{8}$  of a tone, and that as age increases the sensitiveness increases, although marked irregularities in this general increase was noticed at ten and fifteen years. The decrease in sensitiveness at these periods the author thinks is probably due, the former to second teething and the latter to puberty."

Dr. Scripture and Mr. Lyman found that in "ten boys of the average age of thirteen years of the upper grammar grade" for

drawing a straight line between two dots 100 mm. apart, "the facing position is more favorable for horizontal and vertical lines than it is for inclined lines. The right side position is also more favorable for horizontal and vertical lines than for lines at 45°. Holding the pencil far from the point is in general the most accurate method; near the point is as accurate as the middle grip."

To understand the apparatus described in the other articles, the reader is referred to the original, where they are illustrated and adequately described.

F. B. D.

*L'audition Colorée et les Phénomènes Similaires.* Communications de MM. FRANCIS GALTON et EDOUARD GRÜBER.

The results of the investigations set forth in this paper were read at the Congress of Experimental Psychology at London, 1892. After giving a table of the "chromatisms and photisms of the senses," the results of investigations concerning colored auditions is taken more at length, and especially that of the speaking voice. The subject experimented on heard *a* as pure white; *e*, yellow; *i*, blue; *o*, very black; *u* (*ou*) black; *ä*, brown, and *î*, gray, approaching black. The same thing occurred for the consonants, except at the moment of hearing, the subject perceived two colors; one, the color of the consonant, and the other, a slight ray corresponding to the vowel used in speaking the name of the consonant. For example *f* (*ef*), is accompanied with the perception of a reddish-brown and a slight orange tint on the front side. This orange tint, the author thinks is due to the influence on the usual color (yellow) of *e*, of the reddish-brown of the letter *f*. This leads to the attempt to separate the vowel sounds from the consonants. The facts stated in this paper are very interesting, but perhaps not as important as the author thinks when he says: "These facts are of very great importance; they touch almost all the great problems of contemporary psychology. Moreover, they show a new path for crossing the field of the spiritually unknown, and give us a superior means of analysis."

F. B. D.

*Die bewusste Beziehung zwischen Vorstellungen als konstitutives Bewusstseinsmoment.* Ein Beitrag zur Psychologie der Denker-scheinungen. Von DR. E. SCHRADER. Leipzig, Verlag von Duncker und Humblot, 1893, pp. xii., 84.

This pamphlet is the first of a proposed series of works upon judgment; more accurately, upon the place of the consideration of judgment in psychology and logic. I propose to devote some space to its criticism, since the author is making a serious attempt to answer a real and difficult question.

I may say at once that I do not regard the word "judgment" as a psychological, but only as a logical term. The psychological correlate of a judgment is an association or an apperceptive combination. I should, therefore, demur to the phrase "psychology of judgment" upon methodological grounds. The writer renounces it in favor of "psychology of conscious relation," for the reason that this is the more comprehensive expression—including judgments which are and judgments which are not formulated in language. But the confusion remains: a "relation" in psychology is just an association; relating is the logical way of marking associability (cf. preface, p. vi.).—A second point touched on in the preface is the relation of the association-psychology to psychology in general. While Dr. Schrader rightly refuses with decision to equate the two, he still